

LAWRENCE LIVERMORE REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: April 19-26, 2010

Reliable nukes without testing



Inside the High Explosives Applications Facility (HEAF).

Since nuclear weapons testing was banned 18 years ago, how can you tell if an aging nuclear weapon is safe and reliable?

That's where Lawrence Livermore scientists step in and model what happens inside a nuclear weapon with the fastest supercomputers. And soon, the world's largest laser, the National Ignition Facility, will be able tell if an aging nuclear weapon is safe and reliable with virtual testing.

CNN foreign affairs correspondent Jill Dougherty recently visited the Laboratory for her report on the state of aging nuclear weapons. She interviewed the Lab's NIF Director Ed Moses, Deputy Director of Computation Mike McCoy, High Explosives Applications Facility Operations Manager Brian Cracchiola and Weapons Program Director Bruce Goodwin.

To watch the interviews, go to

https://publicaffairs.llnl.gov/news/lab_report/movies/cnn_stockpile-stewardship16apr2010.mov

Purrfectly designed computers



Electronic devices that mimic how brain cells in a cat work could allow computers to one day learn and recognize information more like humans do.

The idea is to create an electric brain as smart as a cat -- for instance, one that can figure out the shortest route from the front door to the food dish in a house full of furniture time after time, even if one moved the food dish each time. Such brain-like devices might accomplish more complex decisions and perform more tasks simultaneously than conventional computers are capable of.

One of the world's most sophisticated supercomputers -- Dawn, at LLNL -- can simulate 1 billion neurons and 10 trillion synapses, exceeding the scale of a cat brain. Still, it is a massive machine with more than 140,000 central processing units that needs a million watts of electricity. And at that, it still performs 100 to 1,000 times slower than a cat's brain.

The goal is to create a supercomputer that can purrrfectly mimic a cat's brain and beyond.

To read more, go to

http://news.yahoo.com/s/livescience/20100416/sc_livescience/catbraininspirescomputersofthefuture

Storing the carbon underground



Underground coal gasification (UCG), a century-old idea, could be the budget-minded savior to curbing greenhouse gas emissions. Advocates say it could triple U.S. coal reserves; put an end to dangerous underground and environmentally degrading surface mining; and provide an affordable way to collect CO₂ emissions for storage. And it can be done without the technical mishaps and water contamination that have plagued past efforts.

Simply put, it is "coal energy with a natural gas footprint," said Julio Friedmann, leader of LLNL's carbon management program.

One recent estimate has placed the cost of UCG plants with CO₂ storage as equal to those of surface coal-fired plants without any capture technology. Other estimates have found the synthetic gas UCG produces cheaper than natural gas, even at current depressed levels.

To read more, go to <http://www.nytimes.com/gwire/2010/04/16/16greenwire-researchers-explore-coal-without-mining-in-bid-90786.html>

The smallest of smallest contaminants



Lab biologist Crystal Jaing holds up a Microbial Detection Array slide.

State-of-the-art Lab detection technology recently was used to confirm that a vaccine used to prevent diarrhea in babies also contained a benign pig virus.

The Lab's Microbial Detection Array can not only detect contamination in a vaccine, but it allows for more precise genetic testing that can be used in both biodefense and in the doctor's office.

It also works in product safety to tell you how clean a commercial product is, according to Crystal Jaing, one of the Lab's researchers using the array.

To see more,
[https://publicaffairs.llnl.gov/news/lab_report/movies/KGOTV_MicrobialDetection18apr2010.mo](https://publicaffairs.llnl.gov/news/lab_report/movies/KGOTV_MicrobialDetection18apr2010.mov)
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It's all elemental, my friends



Ken Moody

When recently discovered element 117 was added to the periodic table, it wasn't exactly an ah-hah moment.

Lab research chemist Ken Moody (who has helped in the discovery of six new elements -- 113, 114, 115, 116, 117 and 118) recently told NOVA that the discovery of new elements isn't always as exciting as one would assume. In the case of 117, he said they weren't sure at first and so remained cautious.

"Sorry, no shouts of 'Eureka!', no joyous dancing in the halls, and no victorious toasting," Moody said. But a few weeks later the team detected a second tell-tale occurrence. "It was consistent with the previous event in most particulars," Ken wrote, "and while random events can always bite you when you have only one of something, if you have two and they look alike, the assignment is pretty definite." In the end, the team detected six atoms -- enough to secure element 117 a place on the periodic table.

To read more, go to <http://www.pbs.org/wgbh/nova/insidenova/2010/04/a-new-element-for-the-table.html>

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Photo of the week



Honk if you see goslings: One of the many Lab pairs of Canada Geese watch over their gosling brood. The Canada geese annually return to the Laboratory to breed.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail <mailto:labreport@llnl.gov>.

The *Livermore Lab Report* archive is available at:
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